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Effect of Nano Silver Antibacterial Dressing Combined with Comfortable Nursing on Patients After Laparoscopic Cholecystectomy

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Abstract

Silver ions, soluble silver compounds, large surface area colloidal silver and nano silver have the characteristics of sterilization, bacteriostasis and mildew prevention.In this study, patients who underwent laparoscopic cholecystectomy in the First Affiliated Hospital of Nanhua University from January to May 2010 were selected as the control group (n = 36), and the patients in the same hospital from June to October 2010 were selected as the treatment group (n = 36).The control group was treated with traditional nursing, while the treatment group was treated with new alginate composite nano silver antibacterial dressing combined with comfortable nursing.The results showed that the incidence of complications in the treatment group was lower than that in the control group, and the average score of comfort was better than that of the control group, with significant difference between the two groups ($P < 0.05$).

Keywords: nano silver; calcium alginate; sterilization; nursing

1. Introduction

As a kind of biomaterial, calcium alginate has many unique properties, such as non-toxic, hydrophilic, biocompatible, biodegradable and so on. It is suitable for many biomedical fields(Lu et al., 2019; Bameshki et al., 2018; Belavić et al.,2018; Guler et al.,2019; Pan et al.,2018), and may become an excellent biomaterial (Jia et al.,2018; Deal et al.,2019; Luo et al.,2019), with good mechanical properties and biological adsorption capacity to the constituent materials. Calcium alginate fiber is very suitable for the development of medical dressings (Qiu et al., 2019; Zhihua et al.,2018; Jinyuan et al., 2018), including the regeneration of skin, cartilage, bone and liver, as well as the treatment of exudative wounds and the promotion of wound healing process (Yıldırım et al.,2018). Silver is a famous metal with extensive antibacterial activity.

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It has been used as an antibacterial agent for a long time. Silver ions, large surface area colloidal silver and nano silver have the characteristics of sterilization and sterilization.Among them, nano silver is a new antibacterial product developed based on nanotechnology (Ozcan et al., 2018; Yıldırım et al.,2018). In recent years, it has attracted extensive attention in the field of medicine and medicine, and has been used in various biological applications.Nano silver antibacterial materials have unique properties, such as improving mechanical strength, stimulus response behavior, biological interaction, optical properties and remote driving ability.At present, silver is the most commonly used antibacterial agent on various carriers because of its high biocompatibility, excellent tolerance to sterilization conditions, and can kill a variety of bacteria, and the antibacterial effect is lasting.It has been reported that nano silver destroys microorganisms more rapidly and thoroughly than its cationic form.The combination of silver nanoparticles with hydrophilic and biocompatible polymers can be the basis of a new generation of antibacterial materials (Zhu et al.,2018).Alginate has been proved to be an effective capping agent for silver nanoparticles, which provides biocompatibility and diversity of forms and structures. Therefore, alginate may be used in a

variety of biomedical applications, such as antibacterial coatings, wound dressings and potential tissue implants.In particular, calcium alginate can be used as an effective donor of nano silver, Ag ions and other immobilized bioactive substances, and the mixture of different polymers can improve the stability and degradation rate, and improve the biomechanical properties.

Laparoscopic cholecystectomy (LC) is a minimally invasive operation (Dimagno et al.,2018; Zhu et al.,2018; White et al.,2019). However, the complications of LC are usually higher than those of traditional cholecystectomy (Xu et al.,2019). Therefore, it is of great significance to strengthen the perioperative nursing of IC patients. The purpose of comfortable nursing is to make surgical patients reach the best state in physiology, psychology and society. Therefore, in the whole nursing process of laparoscopic cholecystectomy patients, first of all, we should strengthen the patient's comfort care, reduce the patient's fear of the new operation method, improve the patient's treatment compliance, at the same time, through a variety of intimate nursing and high-quality nursing service, increase the patient's comfort, which is conducive to the cure of the disease. In this study, 36 patients who underwent laparoscopic cholecystectomy in the First Affiliated Hospital of Nanhua University from January to May 2010 were selected as the control group, and 36 patients in the same hospital from June to October in the same year were selected as the treatment group. The control group was treated by traditional nursing, while the treatment group was treated by new alginate composite nano silver antibacterial dressing combined with comfortable nursing. The purpose of this study is to evaluate different nursing methods by comparing the traditional nursing and comfort nursing of patients with laparoscopic cholecystectomy and the new sodium alginate composite nano silver antibacterial dressing, so as to provide reference for perioperative nursing of patients after laparoscopic cholecystectomy.

2 Materials and methods

2.1 Research object

In this study, patients who underwent laparoscopic cholecystectomy in the First Affiliated Hospital of Nanhua University from January to May 2010 were selected as the control group (n = 36), and the patients in the same hospital from June to October 2010 were selected as the treatment group (n = 36). There were 43 males and 29 females with an average age of 47.81 years. There were 38 cases of gallstone, 12 cases of gallbladder polyp and 22 cases of chronic cholecystitis. There was no significant difference in gender, age and disease type ($P > 0.05$).

2.2 Method

The control group was given routine nursing, including preoperative examination, skin preparation, gastrointestinal preparation, intraoperative nursing cooperation, postoperative drainage tube observation, vital signs monitoring, etc.; the treatment group was given comfortable nursing, and the psychological and physiological aspects of patients were intervened.

2.3 Observation index

The number and incidence of postoperative complications were observed.The comfort state scale was used to evaluate the comfort degree.Using Likert ~ 4 scoring method, the higher the score, the higher the comfort; the total score < 60 points is low comfort, 60 ~ 90 points is moderate comfort, and > 90 points is high comfort.

3 Result

3.1 Characterization of nano silver dressing

Figure 1 shows the silver alginate dressing under a 50x electron microscope.Fig. 2 shows a 5000 fold nano silver alginate dressing.It can be seen that the dressing fiber is compact and the thickness is uniform.

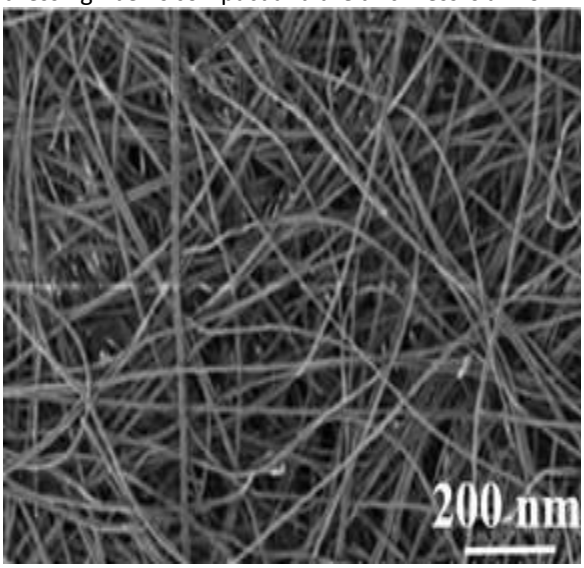

Figure 1 Observation of nano silver alginate dressing under 50 times electron microscope

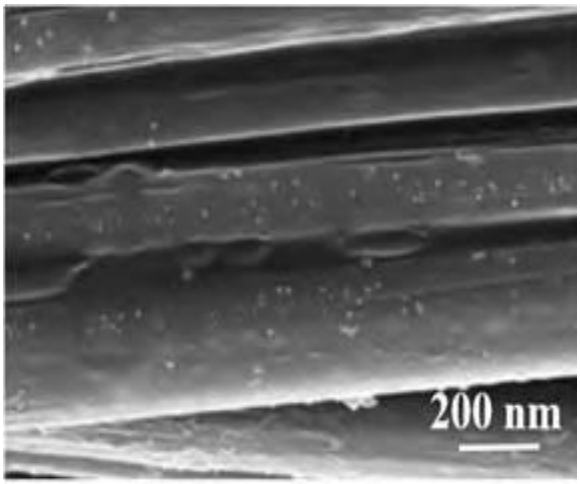

Figure 2 Observation of nano silver alginate dressing under 5000 times electron microscope

3.2 Comparison of postoperative conditions between elderly treatment group and control group

As shown in Figure 3, in elderly patients, It can be seen that the incidence of complications in the treatment group was lower than that in the control group, the difference was statistically significant ($P < 0.05$); the SDS score and SAS score of the treatment group were lower than those of the control group, the difference was statistically significant ($P < 0.05$); as shown in Figure 4, the compliance of the treatment group was higher than that of the control group, with statistical significance ($P < 0.05$).

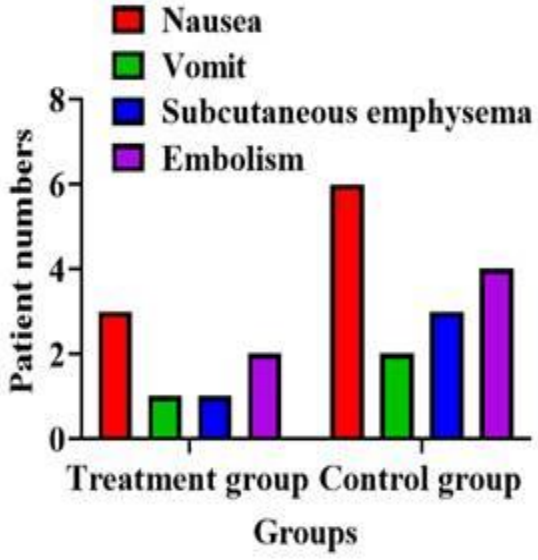

Figure 3 Comparison of postoperative complications between the elderly treatment group and the control group

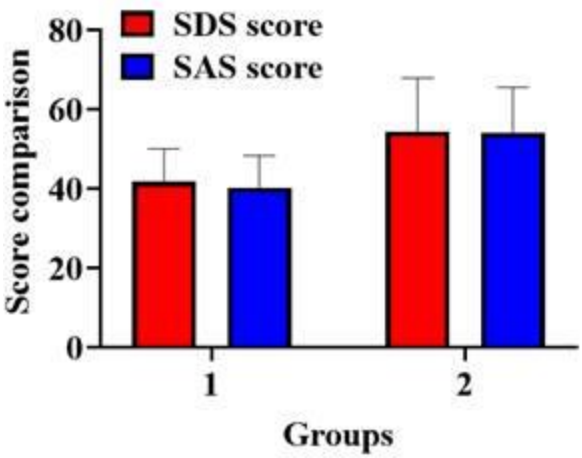

Figure 4 Comparison of treatment compliance between elderly treatment group and control group (1. Treatment group; 2. Control group)

3.3 Comparison of postoperative conditions between young and middle-aged treatment group and control group

As shown in Figure 5, the incidence of postoperative complications and treatment compliance in the treatment group were lower than those in the control group ($P < 0.05$); the SDS and SAS scores of the treatment group were significantly lower than those of the young control group ($P < 0.05$); as shown in Figure 6, the compliance of the treatment group was higher than that of the control group, the difference was statistically significant ($P < 0.05$).

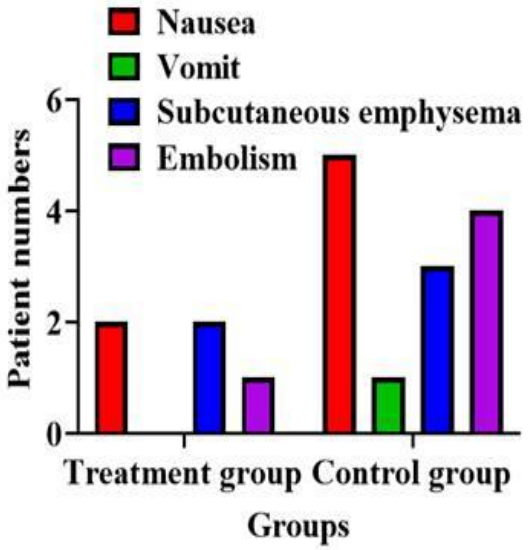

Figure 5 Comparison of postoperative complications between young treatment group and control group

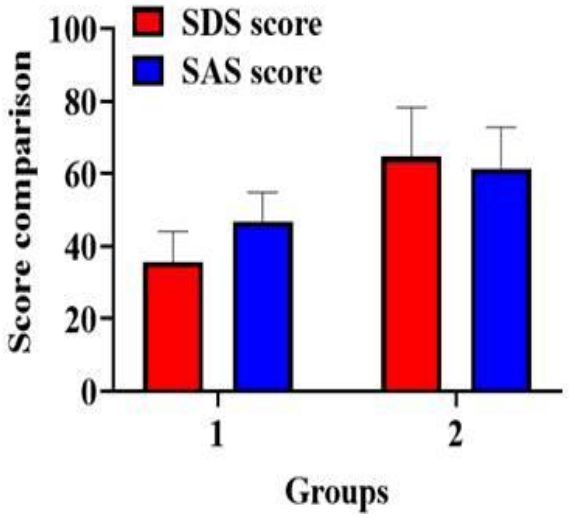

Figure 6 Comparison of treatment compliance between young treatment group and control group (1. Treatment group; 2. Control group)

3.4 Comparison of postoperative satisfaction between the two groups

As shown in Figure 7, the average comfort score of the treatment group [(91.0 ± 8.0) points] was higher than that of the control group [(69.0 ± 15.2) points], the difference was statistically significant ($P < 0.05$).

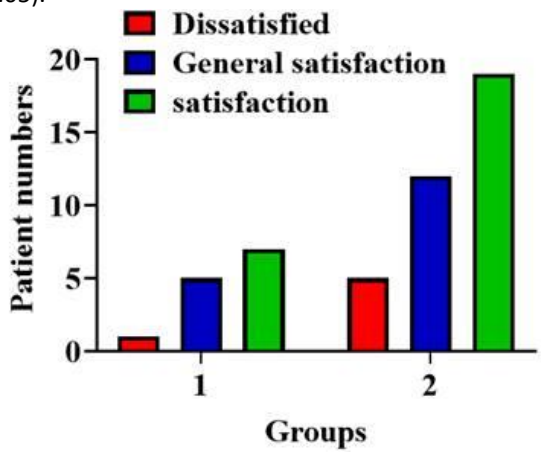

Figure 7 Comparison of treatment effect between treatment group and control group. (1. Treatment group; 2. Control group)

3.5 Discussion

Nanotechnology refers to the process that takes place at the nanoscale.With the increasing interest in nanotechnology, the production and application of nanoparticles are increasing all over the world. There are many methods to prepare metal nanoparticles, and various metal nanoparticles are also used in various consumer categories. The surface volume ratio of nanoparticles is large and has crystal surface structure, which improves their chemical activity. It is well known that silver has the potential to kill bacteria and promote wound healing. The recent emergence of nanotechnology provides a new way to treat wounds. However, the beneficial effect of silver nanoparticles on wound healing remains to be further explored. The most commonly used method for the preparation of silver nanoparticles is the chemical reduction of silver salt by sodium citrate. Many studies have shown that the antibacterial properties of nanocomposite multilayers against gram-positive Staphylococcus epidermidis and gram-negative Escherichia coli vary with the thickness of the multilayers, and the number and reduction cycle of silver nanoparticles. Some studies have pointed out that the antibacterial effect of nano silver antibacterial agent is size and dose-dependent, and its effect on Gram-negative bacteria is more obvious than that on Gram-positive bacteria. The main mechanism of antibacterial properties of bacterial silver nanoparticles is to regulate cell signal residues by anchoring and penetrating the bacterial cell wall, and dephosphorizing the putative key peptide substrate on tyrosine. Recently, silver nanoparticles have been used in various sterilization products. Nanoparticles in silver antibacterial clothing textiles usually have skin contact. However, human skin consists of several layers of semi permeable to impermeable cortex and provides a good protective barrier. It is reported that silver nanoparticles can penetrate the skin. Artificial human skin environment model with sweat was used to detect the release of silver from antibacterial fabric. It is reported that silver nanoparticles will be released into the water environment during the washing process. In addition, other research groups have also reported that silver nanoparticles have toxic effects on reducing algae photosynthetic products and inducing zebrafish abnormalities on aquatic organisms. If silver nanoparticles have the ability to target specific carriers for in vivo sensing, diagnosis and treatment, these unique characteristics may lead to toxicity, damage the physiological function in vivo, and pose a threat to human health and health. Therefore, it is very important to use the minimum concentration of silver nanoparticles to achieve high efficiency. Studies have shown that 20mg silver nanoparticles have an effect on mice. Silver nanoparticles have a high aggregation tendency, which is usually stabilized by surface coating. Both polymerization and surface

coating changed the toxic nanoparticles of silver. For example, biological silver nanoparticles are more toxic than chemically synthesized silver nanoparticles, while citrate coated silver nanoparticles are more toxic than PVP coated silver nanoparticles. In recent years, more and more attention has been paid to the preparation of antibacterial electrospun felt by introducing metal nanoparticles into polymers. Many polymer materials have been used to fix the surface sutures of drugs. The basic functional properties of the edible film depend on the film forming material. At present, it is mainly used to make edible film and coating. General film has good moisture resistance, but its resistance to gas transmission is very small, mechanical strength is poor. In contrast, biopolymer films usually have good oxygen and carbon dioxide barriers, but they have little protection against water migration. On this basis, the electrospun felt based on nano silver and zinc oxide and the application of various biodegradable and non-degradable polymers in wound dressing were reported.

Alginate is a kind of polysaccharide algae with negative charge extracted from brown algae. Sodium alginate is a kind of material with low toxicity, good mechanical properties and biosorption ability to components. Alginate is soluble in water and has unique properties such as non-toxic, hydrophilic, biocompatible and biodegradable. It is suitable for many biomedical fields. Due to its good biocompatibility, sodium alginate has been widely used in the field of tissue engineering, such as wound disinfection [16]. The size of nanoparticles plays an important role in cell absorption. Therefore, in addition to the structure and surface coating, the size of nanoparticles also affects cytotoxicity. Up to now, there are still different conclusions about whether the larger particles or the smaller particles will cause higher reactions. In this issue, small diameter silver nanoparticles were prepared by chemical reduction method and mixed with calcium alginate gel to form colloidal colloidal alginate colloids. The smaller the diameter of silver nanoparticles, the more effective the surface area can be increased. In addition, the efficiency improvement of smaller silver nanoparticles also reduced the amount of silver on the dressing. The silver ion applied to the dressing is combined with biopolymer to form gel liquid, and then applied to wound dressing, which not only increases the antibacterial capacity of the dressing, but also makes the dressing easier and faster, because there is no need to change the original structure and production process of Nanmi particles when using silver. This method can also be applied to other drugs. Different sizes of drugs are directly applied to different sizes of dressings, and the drugs are directly adsorbed on the skin. This can further reduce the dosage of drugs to achieve the purpose of wound healing.

The purpose of comfortable nursing is to make surgical patients reach the best state in physiological, psychological and social aspects(Ologun et al.,2018; Yao et al., 2018; Tafazal et al.,2018).Some studies have shown that finding out the causes of patients; discomfort and taking effective measures can make patients in the best state of physical and mental recovery(Kohn et al.,2018; Zhong et al., 2019; Zhao et al.,2018).The modified calcium alginate carboxymethyl fiber composite has a high adsorption rate and a large number of negative groups on its surface, which can adsorb and bind nano silver on the fiber surface.On this basis, the nano silver alginate dressing can not only maintain the high absorption rate and degradation of the fiber, but also release the nano silver particles slowly in the humid environment.Silver nanoparticles are ultrafine particles with large specific surface area and can ionize and release silver in solution(Yokota et al.,2018; Parasar et al., 2018; Rubén et al.,2018; DING et al.,2018).Therefore, in the whole nursing process of laparoscopic cholecystectomy patients, first of all, to strengthen the patients comfort care, reduce the patients;s fear of new surgical methods, improve the patients treatment compliance; at the same time, through a variety of intimate nursing and high-quality nursing services, increase the patients;s comfort, which is conducive to the cure of the disease.

4 Conclusion

To sum up, this study compared the effect of traditional nursing and comfortable nursing with new alginate composite nano silver antibacterial dressing in patients undergoing laparoscopic cholecystectomy to evaluate the advantages and disadvantages of different nursing methods, so as to provide reference for perioperative nursing of patients after laparoscopic cholecystectomy.The results show that the silver nanoparticles used in this study are all less than 10 nm. Applying different sizes of drugs on different sizes of dressings can make the drugs directly contact the skin, which can further reduce the dosage of drugs and promote wound healing.

Conclusion

compared with traditional nursing, comfortable nursing can reduce the occurrence of postoperative complications, reduce negative psychology, improve the treatment compliance of patients, and effectively improve the treatment effect.

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